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THE TAXONOMIC POSITION OF THE GENUS *PETRIA* SEMENOW (COLEOPTERA: ALLECULIDAE)

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ABSTRACT. The beetle genus *Petria* Semenow includes a few species inhabiting the Kara-Kum Desert, U.S.S.R. They are known only from males, which are soft-bodied, with short elytra, long antennae, and large eyes. The genus is usually placed in a separate family, the Petriidae, within the section Heteromera, but some Russian workers have included it within the family Alleculidae. A detailed study of *Petria antennata* Semenow provides abundant evidence supporting the inclusion of *Petria* within the subfamily Omophlinae of the Alleculidae. Brief descriptions and figures are given for the prothorax, metendosternite, hindwing, tarsal claw, abdomen, and male genitalia, and comparisons are made with members of the Alleculidae and other heteromeran families. Speculations are made concerning the habits and habitat of the larva and female based on knowledge of related omophlines and analogous types of desert-inhabiting Coleoptera.

The genus *Petria* Semenow includes a few species of peculiar looking beetles that inhabit the Kara-Kum, a desert east of the Caspian Sea (Turkmen S.S.R.). The group is known only from males, which are attracted to lights at night. They are relatively small (3.0–4.25 mm), soft-bodied, and lightly pigmented insects, with shortened elytra, long antennae, and large, prominent eyes (*see* illustrations in Jacobson, 1913, 1915; Ogloblin and Znoiko, 1950; and Znoiko, 1936). The genus has been placed in a separate family, the Petriidae, which is considered in most general texts to be of uncertain phylogenetic position within the section Heteromera (Crowson, 1955).

Although Semenow (1893, 1896) made *Petria* the type of a new family, he considered the genus to be related to members of the

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Alleculidae and particularly the omophline genus *Steneryx* Reitter, also from Central Asia. Most later authors recognized the family Petriidae, but Znoiko (1936) presented evidence for the inclusion of *Petria* within the alleculid subfamily Omophlinae and pointed out a transition in general form, eye size, wing venation, tarsal claws, and antennal structure, among the species of *Petria, Steneryx,* and a third genus, *Cnecosochara* Reitter, also known from males only. In spite of Znoiko's conclusions, the Petriidae is still treated as a heteromeran family of doubtful affinities, and Crowson (1955) made no attempt to place it, since specimens for dissection were not available to him.

The major problem in classifying *Petria* on the basis of superficial characters is that, while it closely resembles several Alleculidae, it has been thought to lack the main diagnostic features of that family, namely, the closed procoxal cavities, connate basal abdominal sternites (3–5), and pectinate tarsal claws. In order to obtain material for dissection, I wrote to Leningrad, and, through the kindness and cooperation of Dr. G. S. Medvedev of the Zoological Institute, Academy of Sciences, U.S.S.R., received three specimens from Semenow's series of *P. antennata,* collected at Utshadzhi in May of 1889. Sincere thanks are due to Dr. Medvedev and the Zoological Institute. I am also grateful to R. A. Crowson for his continual inspiration, comments, and criticisms, and to P. J. Darlington, Jr., and T. F. Hlavac for their useful suggestions and critical review of the manuscript. Although specimens of *Steneryx* and *Cnecosochara* were not available for study, dissections were made of *Cteniopus flavus* (Scopoli) and examinations were made of several alleculids and other Heteromera.

A study of the above material revealed the following features of *Petria antennata* that shed some light on its phylogenetic relationships:

1) The procoxae are subconical, projecting, and almost contiguous, the intercoxal process of the prosternum being laminate (Fig. 1), but each coxa bears a relatively large articular region (a), which is concealed by the coxal cowling (c), so that the articulation with the pleuron is internalized (Fig. 2).

2) The pleuro-coxal mechanism of the prothorax is of the tenebrionoid type, with the endopleuron fused to the notal wall and the trochantin apparently absent.

3) The procoxal cavities are closed internally and open externally or posteriorly (Fig. 1).

4) The mesocoxal cavities are not closed outwardly by the meso- and metasterna and are thus contiguous laterally with the mesepimera.

5) The metendosternite is of the tenebrionoid type, with a narrow stalk, no laminae, and the anterior tendons out near the apices of the lateral arms (Fig. 3).

6) The tibial spurs are neither serrate nor pubescent.

7) The tarsal claws each have two or three toothlike projections (Fig. 5).

8) The hindwing is similar to that of most tenebrionoids, with four well-developed anal veins (in the main group), an anal or wedge cell (w) present, and a short stalk of R_s extending basad of the radial cell (not shown in Znoiko, 1936) (Fig. 4).

9) Abdominal sternites 3, 4, and 5 are connate. This is not easily observed without sectioning, since all the segments are broadly overlapping (Figs. 6 and 7).

10) Abdominal sternite 7 has a pair of posterolateral gland openings (Fig. 9) similar to those found in *Cteniopus* (*see* Kendall, 1968).

11) Abdominal sternite 8 is developed into a pair of claspers (Figs. 6 and 8) that are similar to those of alleculids (*see* Campbell, 1966; Champion, 1888; Kaszab, 1969; McDonald, 1960; and Ogloblin and Znoiko, 1950).

12) The aedeagus is of the normal (not inverted) heteromeroid type, with a long basal piece (b), short tegmen (apical or cap piece) (t), and the median lobe (m) membranous except for a ventral strut (or two fused struts) at the apex (Fig. 10). This is a typical alleculid aedeagus as illustrated in Campbell (1966, 1968); McDonald (1960); Marshall (1970a, 1970b); and Sharp and Muir (1912).

Except for the lack of an external coxal closure, the condition of the prothorax in *Petria* is strongly suggestive of a relationship to the tenebrionoid complex of the Heteromera (Tenebrionidae, Lagriidae, Alleculidae, and Nilionidae). The internalization and concealment of the pleural articulation, fusion of the endopleuron to the notum, and reduction of the trochantin are characteristic of

the tenebrionoid families and a few related groups, such as the Colydiidae, Zopheridae, Monommidae, Prostomidae, and Dacoderidae; a similar condition also occurs in certain Clavicornia (Propalticidae, cerylonoid complex) (Crowson, 1955; Hlavac, personal communication; Watt, 1967). The internal closure of the procoxal cavities occurs in most Heteromera, but is absent in the Mycetophagidae, Ciidae, Pterogeniidae, Tetratomidae, Perimylopidae, Zopheridae, Monommidae, Pythidae, and Pyrochroidae. The development of conical, projecting procoxae and a laminate intercoxal process has taken place in various members of the tenebrionoid association (*Lagria, Mycetochara, Cteniopus*), but externally open procoxal cavities are unknown in this large group, except in a few sub-Antarctic forms that are doubtfully included or have been removed (Crowson, 1955; Watt, 1967).

The laterally open mesocoxal cavity is a fairly common feature in the Heteromera, but in the families Prostomidae, Zopheridae, Monommidae, Elacatidae, Mycteridae, Inopeplidae, and Salpingidae the cavity is closed by the meeting of the meso- and metasterna (Crowson, 1955; 1967).

The metendosternite of *Petria* is also of the tenebrionoid type, with no laminae and with laterally placed tendons, and differs from that found in most groups of Heteromera. A similar structure may be found, however, in certain Melandryidae and Scraptiidae, which differ from *Petria* by having serrate or pubescent tibial spurs and free abdominal sternites (Crowson, 1938, 1944, 1955, 1966).

The wing venation also points to the tenebrionoid complex, being almost identical with that of certain omophline Alleculidae and a number of Tenebrionidae; in most Melandryidae, the venation is simpler with the anal cell absent, but in *Melandrya* it is essentially the same as that of *Petria* (Bernet-Kempers, 1923; Crowson, 1955, 1966; Forbes, 1922; Znoiko, 1936).

The fusion of the basal three abdominal sternites and the presence of glands on the seventh sternite are probably the strongest pieces of evidence for the association of *Petria* with the Tenebrionidae and their relatives. The fusion of sternites is not uncommon in the Heteromera and has probably occurred several times, but the connation of the first three appears to be restricted to the tenebrionoids, certain Colydiidae, (*Mrymechixenus, Pycnomerus, Anchomma*) and *Meryx* (Merycidae). Two sternites

are united in the Pterogeniidae, Prostomidae, Cononotidae, Mycteridae, *Lagrioida* (Anthicidae), and a few other genera of doubtful affinities, while four are actually or apparently fused in the majority of Colydiidae, Zopheridae, Monommidae, and Dacoderidae (Crowson, 1955, 1967; Watt, 1967). The situation is complicated by the fact that fusions are not always visible from the surface (as in *Petria*) or intersegmental membranes are concealed (as in *Dacoderus, see* Watt, 1967). The apparent fusion of three basal abdominal sternites, however, is a consistent feature of the tenebrionoid families and is almost always correlated with several other adult and larval characters.

The presence of defense glands on the seventh abdominal sternite is known, according to Kendall (1968), only in the families Lagriidae, Alleculidae, and Tenebrionidae. Although the actual glandular reservoirs were not seen in my material, openings and ducts, similar to those of *Cteniopus sulphuripes* (Linnaeus) and *C. flavus* (Scopoli), were present at the posterior angles of the sternite.

The presence of small teeth on the tarsal claws, the modification of the eighth sternite into abdominal claspers, and the form of the aedeagus all argue for the inclusion of *Petria* in the family Alleculidae, especially when coupled with the several tenebrionoid features mentioned above. Male claspers may be found in other groups, such as the Oedemeridae and Cephaloidae, but the structure of these organs is entirely different and the other tenebrionoid characters are lacking (Arnett, 1951; 1953).

The arguments presented above, when added to the comparisons of Znoiko (1936), leave little doubt that *Petria* belongs in the family Alleculidae and is related to *Steneryx, Cnecosochara,* and their allies in the subfamily Omophlinae. It represents an adaptive extreme characterized by the loosely built and lightly sclerotized body, shortened elytra, large eyes, loss of the combs on the tarsal claws, loss of the external coxal closure, and sexual wing dimorphism. The last feature is not actually known in *Petria* but may be postulated by analogy with other groups known from males only (see below).

Semenow (1893) speculated that the females of *Petria,* since they were never collected along with males, might be wingless parasites of Hymenoptera or Orthoptera, as is the case in certain Meloidae and Rhipiphoridae. In other omophlines, however, such

as *Omophlus, Podonta,* and *Cteniopus,* the larvae are soil inhabitants, feeding on various roots and tubers, while the adults are usually found on flowers and fruits (Aguilar, 1962; Kaszab, 1969). A more reasonable hypothesis, then, would be that *Petria* larvae are root feeders and that the wingless females live either in the soil or at the bases of shrubs or grasses. This particular type of wing dimorphism and habitat selection is known in at least two other xerophilous beetles, the males of which resemble those of *Petria,* namely *Vesperus* (Cerambycidae) and *Anorus* (Dascillidae). Species of *Vesperus* inhabit the Mediterranean Region; the wingless female deposits her eggs above the ground, and the fast moving, triungulinlike larvae enter the soil and are transformed into radically different grubs, which feed on roots (Balachowsky, 1962). *Anorus* species occur in the deserts of southwestern North America and Chile; the larvae are unknown (but those of the related *Dascillus* are root feeders), and the only known female is wingless and subterranean (Blaisdell, 1934). It is likely that the females and larvae of *Petria,* when they are discovered, will have similar habits.

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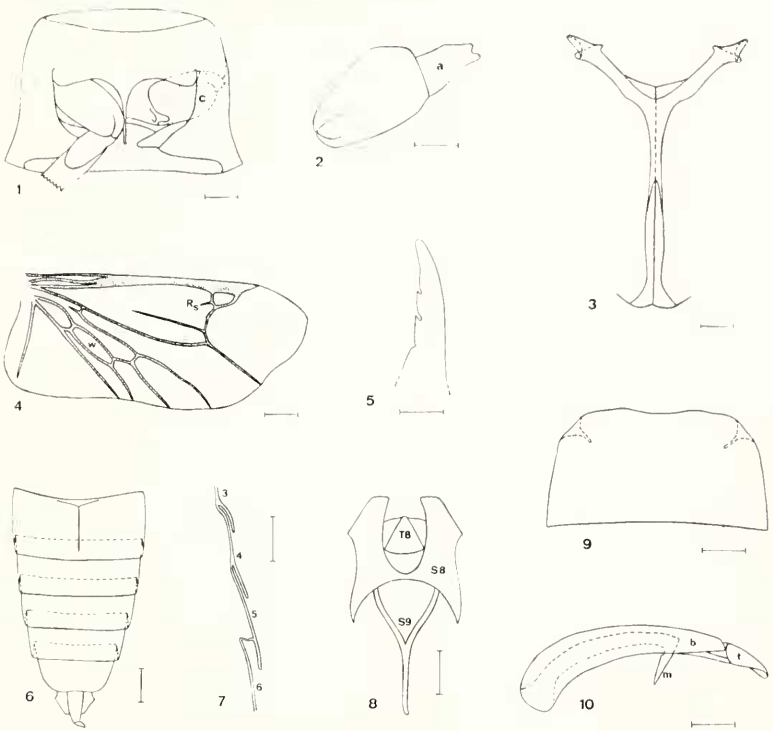

Figures 1–10. *Petria antennata* Semenow, male (1 line = 0.125 mm unless otherwise indicated). Fig. 1. Prothorax, ventral view, with left coxa removed. Fig. 2. Procoxa, showing internal articular area (a). Fig. 3. Metendosternite, dorsal view. Fig. 4. Hindwing (0.50 mm). Fig. 5. Tarsal claw (0.038 mm). Fig. 6. Abdomen (0.25 mm). Fig. 7. Cross section of abdominal sternites 3–6 (0.076 mm). Fig. 8. Abdominal claspers and associated structures, ventral view. Fig. 9. Abdominal sternite 7, showing glandular ducts and openings. Fig. 10. Aedeagus, lateral view.